1 Circle

1. Find the equation of a circle whose centre is (3, 1) and which pass through the point (5, 2).
2. Find the equation of the tangent to the circle $x^2+y^2-4x-6y-12=0$ at (-1, -1)

2 Measures of Dispersion

1. Given below are the marks out of 25 of 5 students in mathematics test. Calculate the variance and standard deviation of these observations. Marks : 10, 13, 17, 20, 23

   A die is rolled 30 times and the following distribution is obtained. Find the variance and S.D.

Score (X)	1	2	3	4	5	6
Frequency (f)	2	6	2	5	10	5

3 Functions

1. Prove that, $2\log_b a^4 \cdot \log_c b^3 \cdot \log_a c^5 = 120$
2. If $f(x)=x^2$, $g(x)=x+5$, and $h(x)=\frac{1}{x}$, $x\neq 0$, find $(g\circ f\circ h)(x)$

4 Limits

1. Prove that $\lim\limits_{x\to a}\frac{x^n-a^n}{x-a}=na^{n-1}$ where $n\in N,\ a>0$.
2. Evaluate : $\lim\limits_{x\to 0}\frac{\tan\ x-sin\ x}{x^3}$

5 Angle and its Measurement

1. Convert the following degree measures in the radian measures : i) 70° ii) 120° iii) $\left(\frac{1}{4}\right)^\circ$
2. The measures of the angles of the triangle are in A. P. The smallest angle is 40. Find the angles of the triangle in degree and in radians.

6 Trigonometry - I

1. If $\tan\theta+\frac{1}{\tan\theta}=2$ then find the value of $\tan^2\theta+\frac{1}{\tan^2\theta}$
2. Prove that $(\sec A-\tan A)^2=\frac{1-\sin A}{1+\sin A}$

7 Trigonometry - II

1. Find the value of cos 15°
2. Prove that tan 20° tan 40° tan 60° tan 80° = 3

8 Determinants and Matrices

1. Solve $x+y+z=6, x-y+z=2, x+2yz=2$ using Cramer's Rule.
2. Solve $x+y-z=1, 8x+3y-6z=1, -4x-y+3z=1$ using Cramer's Rule.

9 Straight Line

1. Find equations of lines which pass through the origin and make an angle of 45° with the line $3x-y=6$.
2. Find the equation of line which passes through the point of intersection of lines $3x+2y-6=0,\ x+y+1=0$ and the point A(2,1).

10 Conic Sections

1. Find the equation of tangent to the parabola $y^2=9x$ at (1,-3).
2. Find the eccentricity of an ellipse whose length of the latus rectum is one third of its minor axis.

11 Probability

1. If P(A') = 0.7, P(B) = 0.7, P(B/A) = 0.5, find P(A/B) and P(A∪B).
2. An urn contains 4 black and 6 white balls. Two balls are drawn one after the other without replacement, what is the probability that both balls are black?

12 Complex Numbers

1. f a and b are real and $(i^4+3i)a+(i-1)b+5i^3=0$, find a and b.
2. Find the square root of $3-4i$.

13 Sequences and Series

1. Find three numbers in G.P. such that their sum is 42 and their product is 1728.
2. For a G.P. if $S_3=16$, $S_6=144$, find the first term and the common ratio of the G.P.

14 Permutations and Combination

1. How many different ways are there to arrange letters of the word 'WORLD'? How many of these arrangements begin with the letter R? How many arrangements can be made taking three letters at a time?
2. Find n and r if ${}^nC_{r-1} : {}^nC_r : {}^nC_{r+1} = 14 : 8 : 3$

15 Methods of Induction and Binomial Theorem

1. By method of induction, prove that. $5^{2n}-1$ is divisible by 6, for all $n \in N$
2. Find the middle terms in the expansion of $\left(2x-\frac{1}{4x}\right)^9$

16 Sets and Relations

1. In a survey of 100 consumers 72 like product A and 45 like product B. Find the least and the most number that must have liked both products A and B.
2. A and B are two sets given in such a way that A×B contains 6 elements. If three elements of A×B are (1, 3), (2, 5) and (3, 3), find its remaining elements.

17 Continuity

1. If $f(x)=\begin{cases}\frac{xe^x+\tan x}{\sin 3x} & x\neq 0\\ k & x=0\end{cases}$ is continuous at $x=0$, find k.
2. Examine continuity of $f(x)=\begin{cases}\frac{\log x-\log 5}{x-5} & x\neq 5\\ \frac{1}{5} & x=5\end{cases}$ at $x=5$

18 Differentiation

1. Find the derivative of $\sqrt{x}$ from the definition.
2. If $f(x)=p\tan x+q\sin x+r, f(0)=-4\sqrt{3}$, $f\left(\frac{\pi}{3}\right)=-7\sqrt{3}$, $f'\left(\frac{\pi}{3}\right)=3$, then find p,q,r.